Chapter 12

Diet, Economy and Status: Evidence from the Animal Bones

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Excavations at Tell Brak during 1994 to 1996 produced a small but significant collection of vertebrate remains. These were recovered both by hand collection and through the implementation of a systematic sampling and recovery programme using both dry- and wet-sieving techniques. The vast size of the mound of Tell Brak, and the inevitably limited physical scope of archaeological investigations, brings into question just how representative any of the excavated material really is of the changing aspects of daily life and economy in the past. This concern is further compounded by the often small size of the recovered assemblages. In terms of identifiable fragments, the numbers of bones recovered and recorded from the three seasons at Tell Brak were relatively small: less than 1500 fragments from dry sieving and less than 1000 from wet sieving. Once these quantities are divided between the different excavated trenches, and the broad range of phases present in each trench, individual assemblage size falls well below 500 fragments (see Table 12.1). As a result, much care, and indeed scepticism, must be employed when attempting to draw statistically valid and meaningful interpretations from such small datasets. Nevertheless, with these caveats in mind, some interesting observations can be made about the vertebrate assemblage recovered from Tell Brak.

Table 12.1. *Number of identifiable fragments recorded from hand-collected and dry-sieve assemblages by trench and by phase.*

	I	II	III	IV	V	Total
HF			3			3
HF1			21			21
HF2			6			6
HL			18			18
HN					317	317
HS1		371				371
HS2			183			183
HS3				267		267
HS4			39	40		79
HS5				72		72
HS6	48					48
Total	**48**	**371**	**270**	**379**	**317**	**1385**

In this paper, and the accompanying tables and figures, phase numbers correlate with cultural periods and trenches as follows:

Phase	Cultural period	Trench
I	Early Uruk	HS6
II	Middle Uruk	HS1
III	Ninevite 5	HS2, HS4, HF, HL
IV	Later third millennium	HS3, HS4, HS5
V	Early second millennium	HN

Methods

The vast majority of the hand-collected and dry-sieved material was identified and recorded on-site during the field seasons, using a small portable comparative collection. Those remains which could not be confidently assigned to species, in addition to all the vertebrate fragments sorted from the wet-sieved residues, were exported to laboratories in Britain and Belgium where more detailed identification and analysis was undertaken. The mammal and avian remains were identified using the comparative collection of the Environmental Archaeology Unit, University of York, whilst the fish remains were compared to the extensive collection housed at the Royal Museum of Central Africa, Tervuren, Belgium.

Due to the short time available for the recording of the hand-collected and dry-sieved material during the field season, a limited suite of elements was recorded for the most common species: sheep/goat, pig, cattle, gazelle and equid. For these taxa, the skeletal elements that were included in the final recording protocol were selected on the basis of their archaeological visibility and usefulness, namely ease of identification to species, representation of different parts of the skeleton, and the availability of useful biometrical and age-at-death data. The protocol for recording is available upon request from the authors.

In the case of less common taxa such as wild mammals and birds, although few in number, all identifiable fragments were recorded where possible. As a result of this inherent bias in the data set, any comparative statistical analysis between species is restricted to the most common taxa mentioned above.

The major mammal species

Frequency of taxa

The total assemblage was recovered from deposits which, in terms of ceramically-based and calibrated radiocarbon dating, span many centuries from late fifth to early second millennia BC. Once the vertebrate assemblage is classified in terms of chronological date, clear differences are apparent between the relative frequencies of the most common mammalian taxa.

Table 12.2. *Number of identifiable fragments recorded from hand-collected and dry-sieve assemblages by species and by phase.*

Species		I	II	III	IV	V	Total
Apodemus/Mus sp.	mouse	-	-	2	-	-	2
Mus musculus	house mouse	-	-	1	-	-	1
Lepus capensis	cape hare	-	-	-	-	1	1
cf. *Mellivora capensis*	?honey badger/ratel	-	-	1	-	-	1
Canidae	dog family	-	3	1	9	3	16
cf. *Vulpes* sp.	small fox	-	1	2	1	-	4
cf. *Vulpes vulpes*	?fox	-	-	1	1	-	2
Felis sp.	cat	-	-	1	-	-	1
cf. *Panthera leo*	?lion	-	1	-	-	-	1
Equidae	horse/wild ass/donkey	2	2	18	25	49	96
Sus f. domestic	pig	1	7	18	149	55	230
Cervidae	deer	-	-	2	-	-	2
?Cervidae	?deer	-	-	1	-	-	1
Cervus elaphus	red deer	-	-	2	-	-	2
Bos sp.	cattle	4	13	9	16	27	69
Gazella sp.	gazelle	5	10	77	7	40	139
cf. *Gazella* sp.	?gazelle	-	-	-	-	3	3
Capra f. domestic	goat	3	24	19	22	11	79
cf. *Capra* f. domestic	?goat	2	20	9	10	11	52
Ovis f. domestic	sheep	9	150	43	65	49	316
cf. *Ovis* f. domestic	?sheep	1	8	4	10	3	26
Caprine	sheep/goat	21	133	64	69	52	339
	sheep/goat/gazelle	-	1	3	4	13	21
	Large mammal	-	-	-	-	1	1
cf. *Branta leucopsis*	?barnacle goose	-	-	1	-	-	1
cf. *Anthropoides virgo*	?demoiselle crane	-	-	1	-	-	1
Pterocles sp.	sand grouse	-	1	8	1	-	10
Columbidae	Pigeon/dove family	-	-	-	-	1	1
cf. *Columba livia*	?rock dove	-	1	1	1	3	6
Corvus corax L.	raven	-	-	1	-	-	1
Testudo sp.	tortoise	-	-	-	1	-	1
Amphibian		•	-	-	-	-	•
Total		**48**	**375**	**290**	**391**	**322**	**1426**

It is clear from Table 12.2 that the most common species recovered from the site are not surprisingly the bones of domesticated mammals, primarily sheep and goat, followed by domestic pig and cattle. Although the majority of wild taxa, both birds and mammals, are present in much lower frequencies, the remains of gazelle are more numerous than those of even equid and cattle.

Figure 12.1 shows the frequency of the main mammals by phase, based upon the number of identifiable specimens (NISP). As can be clearly seen, the importance of remains of sheep and goat is highest throughout all phases. In phase II, however, their remains represent >90 per cent of all species recovered (but of a total of only 371 identifiable fragments), whilst in phases III–V, their proportion is reduced to between 50 per cent and 40 per cent. The remains of larger domestic bovids never rise above 10 per cent for all periods (their highest frequency being in phase V), whilst the importance of domestic pigs is at its highest during period IV, where their remains are almost as frequent as sheep and goat. In terms of wild game, the only species present in substantial numbers is the gazelle which, on the basis of overall size and on horn-core morphology of the few fragments recovered, is likely to be the goitred gazelle, *Gazella subgutturosa*. Figure 12.1 shows that the remains of gazelle are the second most frequent mammal recovered from phase III deposits, representing >30 per cent of all major mammal fragments, and also similar in frequency to cattle and pig in period V.

A separate and arguably more representative method of calculating the relative importance of species through time is by using minimum number of individual (MNI) counts. This method reduces the bias of using fragment counts by only including bones, or fragments of bone, which cannot be counted more than once. Figure 12.2 shows the percentage frequency of the three most common taxa as represented by their MNI counts. Rather comfortingly, this method of calculation shows an almost identical pattern of the relative importance of each species at Tell Brak through time to that noted using raw identifiable specimen counts (NISP: Fig. 12.1). Caprines (i.e. sheep and goats) are once again very common from phase II deposits. Gazelle are again most common in phase III and pig are now the most frequent species represented in phase IV.

The remains of caprines have thus far not been separated in any analyses. Changes in the relative proportions of sheep to goats may, however, provide important information in attempting to understand the economic priorities and goals of ancient and modern pastoralist communities. Figure 12.3 shows the relative proportions of sheep and goat fragments based on the total number of identifiable specimens. Although the relative importance of sheep as against goat is similar for all periods, with the values remaining more or less constant, data from phase III may indicate a slight rise in the importance of goat at this time. An almost identical pattern is presented when considering calculations of relative proportions of sheep and goat bones from their MNI counts (Fig. 12.4). Although a general emphasis on sheep and goat may indicate an economic focus towards wool and hair production (see discussion below), more subtle changes in their relative proportions, compared to one another, may suggest additional activities. Higher proportions of sheep over goat will be found, for example, where herding decisions are motivated by interest in energy maximization (Redding 1981). An increase in the importance of goats may be equated with a rise in the importance of milk production. Alternatively, climatic or environmental factors may also play a role. For example, over-grazing, increased aridity (or a combination of these and other factors) may result in the increased importance of goats over sheep.

Comparisons between trenches

All the conclusions proposed thus far are based on the assumption that the material from different trenches and periods are affected by a similar range of taphonomic factors, and that small sample size is not a limiting or biasing factor. Combining data of similar date from different excavation trenches may in fact mask real differences in, for example, modes of occupation, disposal and subsequent preservational factors occurring at different locations on the tell at the same time. In the case of trenches HS1, HS6 and

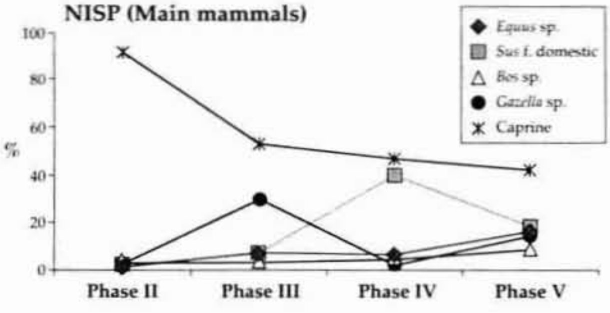

Figure 12.1. *Frequency of the main mammals by phase based on the number of identifiable skeletal parts (NISP).*

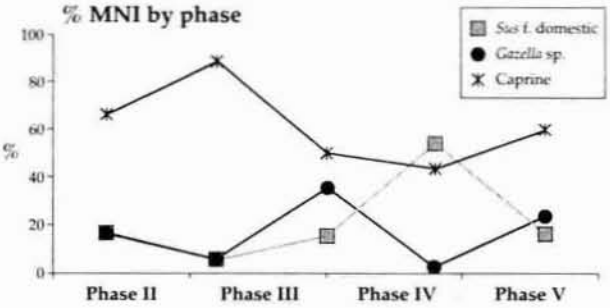

Figure 12.2. *Per cent presence of the three most common taxa as represented by their MNI counts.*

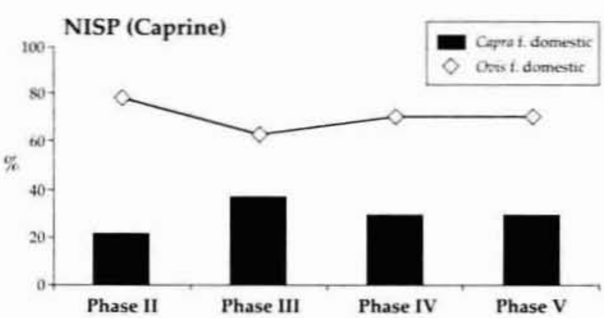

Figure 12.3. *Per cent presence of sheep and goat fragments based on the number of identifiable skeletal parts (NISP).*

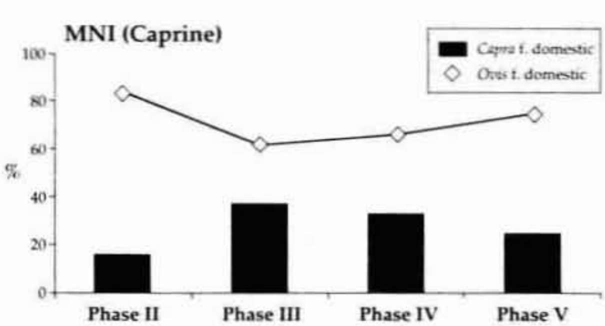

Figure 12.4. *Per cent presence of sheep and goat bones as represented by their MNI counts.*

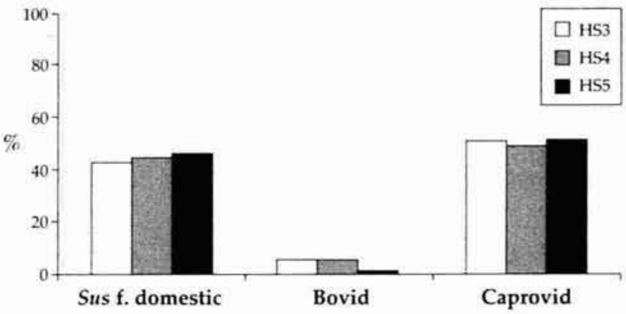

Figure 12.5. *Per cent presence of main domesticates by trench for phase IV (NISP).*

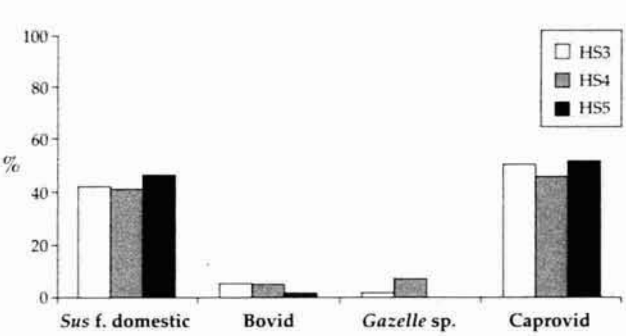

Figure 12.6. *Per cent presence of main mammals by trench for phase IV (NISP).*

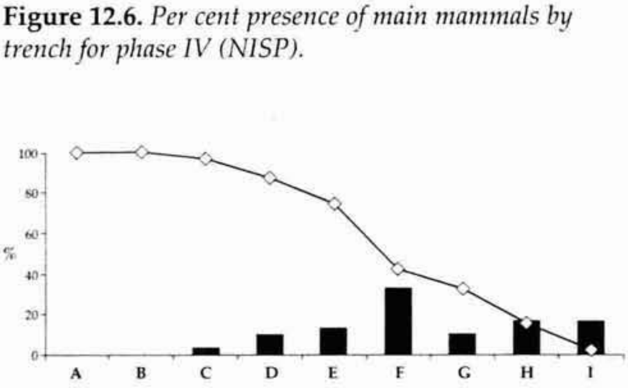

Figure 12.7. *Caprovid age at death (phase IV) based on tooth wear. (After Payne 1973.)*

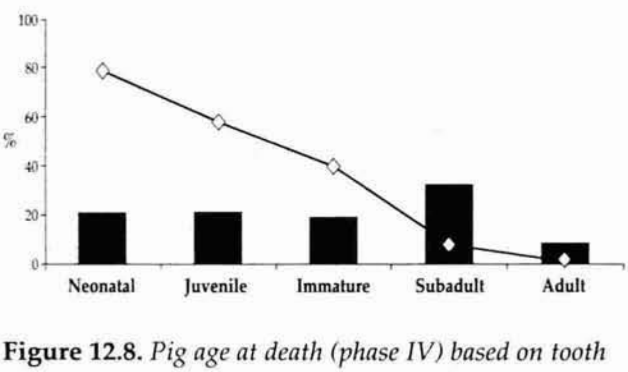

Figure 12.8. *Pig age at death (phase IV) based on tooth wear.*

HN, direct comparisons of the relative frequency of taxa could be made, since material from each represented a single distinct period. For the remaining trenches, however, where similarly phased material was recovered, checks were needed in order to test whether the simple period-based conclusions outlined above are not compromised by differences between trenches. Although data sets from a number of trenches are too small for any meaningful conclusions to be drawn, useful observations made on datasets of >50 fragments, namely assemblages from trenches HS3, HS4 and HS5, phase IV, are outlined below.

Figure 12.5 shows the relative frequency of pig, cattle and sheep / goat remains recovered from phase IV deposits from HS3, HS4 and HS5. As can be clearly seen, values for each taxa plotted by individual trench are extremely similar, indicating that overall species frequency for this period is not seriously compromised by differences in vertebrate assemblages between excavation areas. Slight differences do exist, however, when considering cattle and gazelle remains, for example (Fig. 12.6). In this case it can be seen that the bones of cattle are poorly represented and gazelle remains are wholly absent from trench HS5.

If we consider assemblages dated from phase III from the remaining trenches (HL, HF1, HF2, HS2 and HS4), only HS2 contains >50 fragments (in this case 183). Comparisons with the small HS4 assemblage, only 39 fragments, once again show little difference in relative frequency of the main domestic animals, and a higher frequency of gazelle remains in HS2.

On the basis of these simple comparisons between excavated trenches, it would seem that there are few major differences between larger assemblages from the same period, in terms of the relative frequencies of the major mammal species represented. As a consequence, it seems reasonable to assume that the major differences in the relative importance of certain of these taxa through time, particularly sheep / goat, gazelle and pig, noted above in Figures 12.1–12.2, are of genuine significance.

Age at death data

Due to the restricted size of the assemblages containing elements, particularly mandibles and teeth, which could be used to reconstruct meaningful kill-off patterns, limited information for temporal comparisons is available. Both sheep / goat and pig teeth were recovered in sufficient numbers from phase IV deposits, however, to enable kill-off profiles to be es-

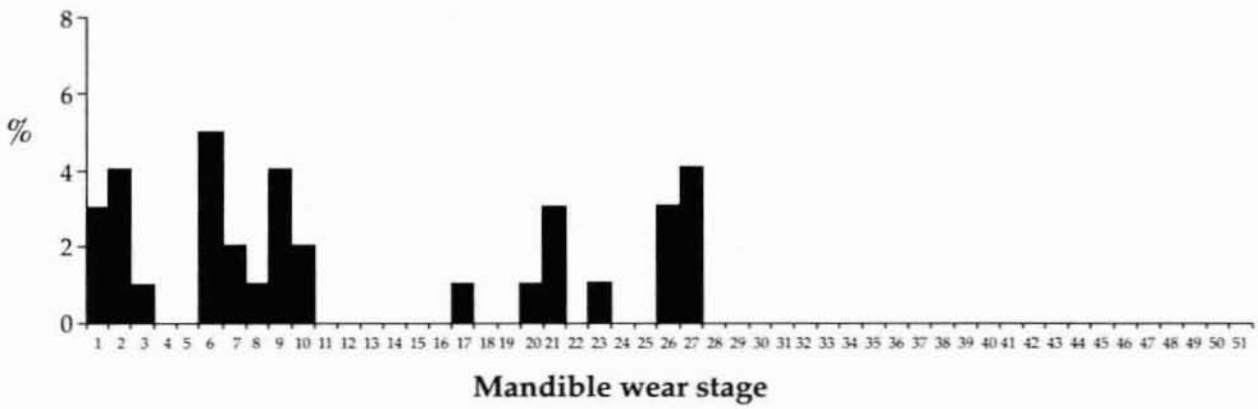

Figure 12.9. *Pig (phase IV) mandible wear stages. (After Grant 1982.)*

tablished. Figure 12.7 shows the pattern created for sheep/goat tooth wear and eruption data (after Payne 1973). It shows that although a wide range of ages are represented in phase IV (from category C—I), significant culling of sheep and goats occurs between stages E–F (i.e. between 3–4 years of age). In addition, older, more mature animals (categories H–I) were also present. This kill-off pattern indicates that there was a premium for the 'growing-on' of younger sheep, well beyond the point where full carcass size would have been attained. This pattern is suggestive of an emphasis on the production of wool rather than animals killed primarily for meat, since adult animals of 3+ years would have produced multiple wool clips prior to their slaughter (see discussion below).

The numerous pig mandibles recovered from phase IV deposits also show a wide range of ages at which the animals were slaughtered (Fig. 12.8). Unlike cattle and sheep, pigs were kept principally for their primary products (i.e. meat), although lard and hide were also important. Their high fecundity makes them ideal meat producers, able to withstand regular culling of young individuals. Their ability to produce large litters means that plentiful supplies of pork could be guaranteed. As a result pigs were usually killed prior to full maturation, before the age of three years, and such is certainly the general pattern during phase IV at Tell Brak.

In contrast with the remains of sheep and goats, the vast majority of pigs from period IV were killed prior to reaching skeletal maturity, with over 40 per cent slaughtered at a very young age. However, if we consider the mandibular wear stage data for pigs in more detail (after Grant 1982), it is clear that during phase IV distinct age categories are dying or being selected for slaughter: neonatal/newborn, juvenile and early subadult animals (Fig. 12.9). The absence of individuals showing wear stage scores of between 4–6 and 11–16 suggests that animals were killed at particular times of the year. This assumption relies upon the fact that the animals were born seasonally at approximately the same time, an assumption that probably holds true for temperate Europe but may not be appropriate in Upper Mesopotamia. Whatever the case, suckling pigs and tender young pork were certainly the favoured meat of many of the inhabitants of this part of the site, at least, during phase IV.

Skeletal element distribution

The bones of many animals recovered from archaeological sites are frequently the waste from a wide range of human activities. Ignoring for now the vast problems associated with mixing of deposits and the presence of residual material, most urban assemblages represent a mixture of primary and secondary butchery waste, domestic household refuse, as well as waste from industrial and craft activities. The relative frequencies of various skeletal elements within an assemblage, together with their spatial distribution through various context types, can provide important and detailed evidence regarding some of these activities. For example, a wide range of skeletal elements within an assemblage may indicate that live animals were brought onto the site to be slaughtered and butchered. Alternatively the absence of certain carcass components, such as heads or terminal limb elements, may imply that slaughter and primary butchery were occurring elsewhere.

A preponderance of the major meat-bearing bones, such as scapulae, humeri, pelves, femora, thoracic and lumbar vertebrae and ribs, generally indicates the presence of domestic or household waste. Minor meat-bearing elements such as radii and ulnae, and tibiae and cervical vertebrae, are also asso-

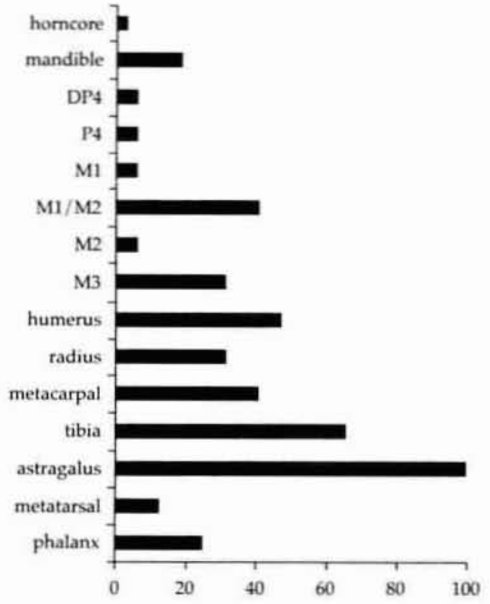

Figure 12.10. *Phase II caprovid elements (MNI).*

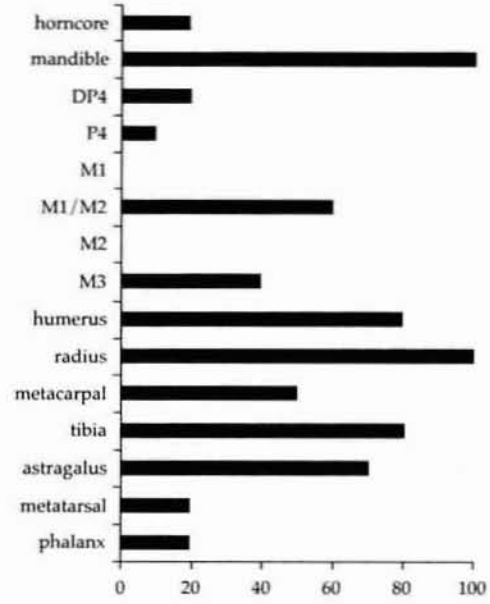

Figure 12.11. *Phase III caprovid elements (MNI).*

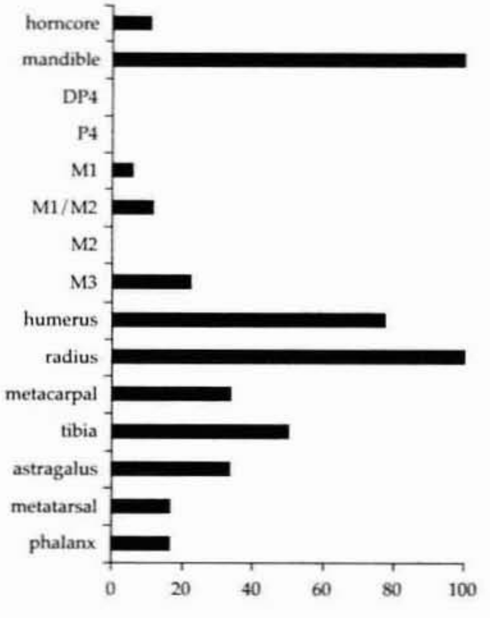

Figure 12.12. *Phase IV caprovid elements (MNI).*

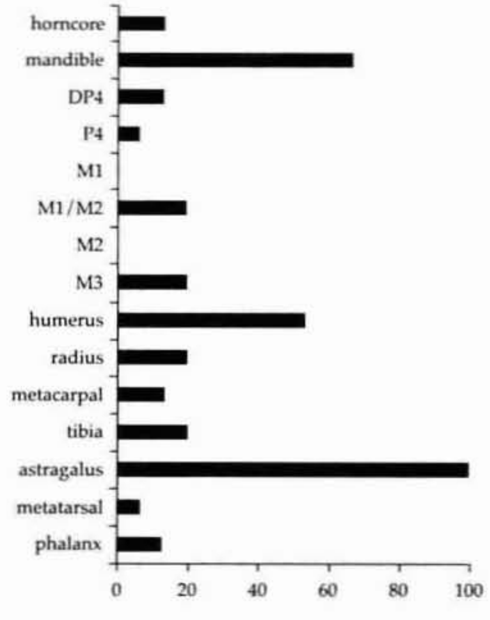

Figure 12.13. *Phase V caprovid elements (MNI).*

ciated with household refuse, although these are usually considered to be cuts of lower quality. Therefore, differences in the proportions of major and minor meat-bearing elements may also provide evidence of socio-economic status.

Fresh hides and horns, removed from the carcass soon after slaughter, were transported in bulk to the tanner, the heads being passed on to the hornworker. Terminal limb elements such as metapodials, particularly of sheep and smaller mammals, and their associated phalanges were often left attached to the hides. Thus, a preponderance of metapodials and phalanges in an assemblage may be a good indication of the presence of tanner's waste. Skulls of sheep-sized and smaller animals were sometimes left attached to the hides, and were only removed during the early stages of hide preparation.

These are obviously very simplistic models, and the real picture at any site is likely to have been far more complex, particularly when considering additional important taphonomic factors such as differential preservation. The possible routes by which bones may be deposited within urban stratigraphy are many and varied. As a result, it would be unusual in most instances to be able to define with certainty all the activities represented by a single assemblage. However, when dealing with a number of assemblages from diverse locations and periods within a large urban centre, as we are in this instance, it is possible to recognize some general patterns, from which useful conclusions may be drawn.

Figures 12.10–12.13 show the relative abundance of recorded skeletal elements of sheep and goat for each period. Once again, the comparison of pooled data between periods assumes that there are little differences between different trenches and context types of the same period. In this case, the largest collections of sheep / goat remains came from trenches where mostly single periods were represented. Thus comparisons of data by period also mainly represents comparisons by trench. What is immediately obvious from the data is that there are striking differences in the representation of skeletal elements through time. Deposits from periods III and IV appear to be very similar in that they are dominated by elements from the head (mandible and teeth, particularly in phase III), as well as major and minor meat-bearing bones, such as humerus, radius and tibia. In contrast, deposits from phases II and V are characterized by fewer mandible fragments and reduced numbers of major meat-bearing bones, such as humerus. Interestingly, the most frequent elements for both these phases are astragali. Lower limb elements, such as metapodials, are much less abundant in all periods.

Although the evidence from all periods appears to reflect a mixture of carcass exploitation and disposal, higher proportions of major meat-bearing bones in deposits from phases III and IV may suggest the waste to be more indicative of household or consumption refuse. The lower proportions of lower limb elements throughout may reflect the presence of 'dressed' carcasses, where the feet and probably the skin were removed as part of the primary butchery.

Sheep/goat biometry

Changes in height and general body conformation of domestic animals can provide additional information regarding differing patterns of animal husbandry through time. The presentation of such data can be used to explore whether local improvements in husbandry practices were under way, or whether new varieties were introduced. Only the remains of sheep were available in sufficient numbers throughout all periods to allow meaningful comparisons to be made of changes in their possible size and shape.

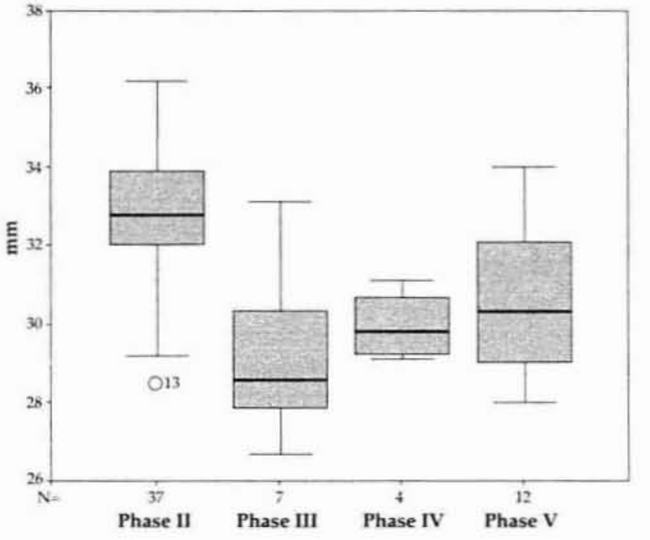

Figure 12.14. *Box plot of sheep astragalus, greatest lateral length (GLl) measurement by phase.*

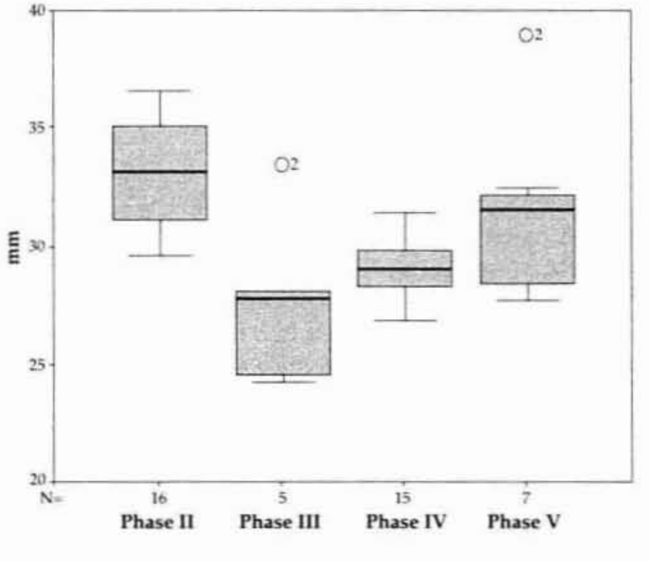

Figure 12.15. *Box plot of sheep humerus, width of distal condyle (BT) measurement by phase.*

Figures 12.14–12.15 show a series of box-plots of single length and breadth measurements from a range of skeletal elements for sheep. Despite the fact that sample size is somewhat small for most periods, the largest and smallest specimens of sheep appear

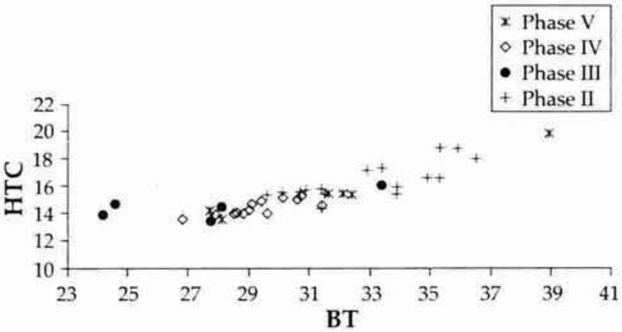

Figure 12.16. *Sheep humerus biometry.*

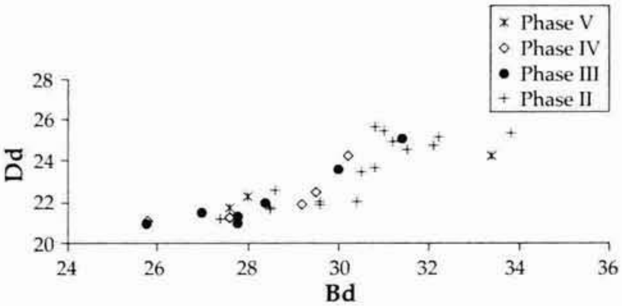

Figure 12.17. *Sheep tibia biometry.*

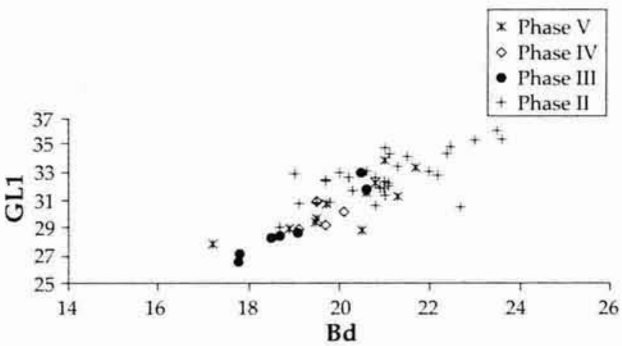

Figure 12.18. *Sheep astragalus biometry.*

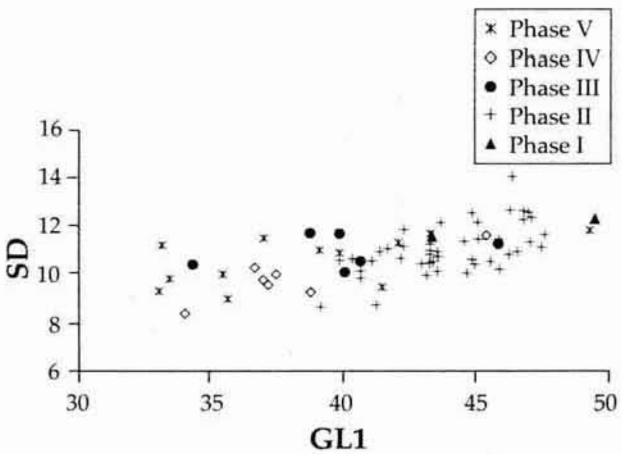

Figure 12.19. *Sheep phalanges biometry.*

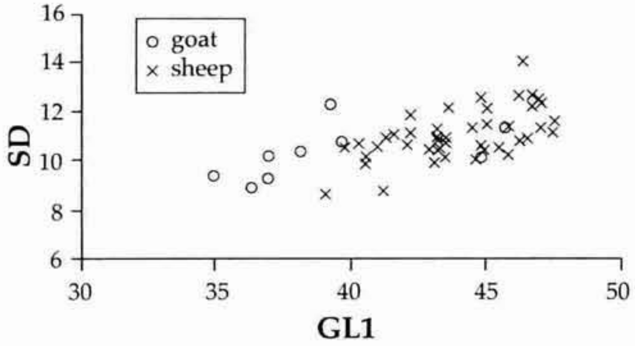

Figure 12.20. *Sheep and goat phalanges, phase II, biometry.*

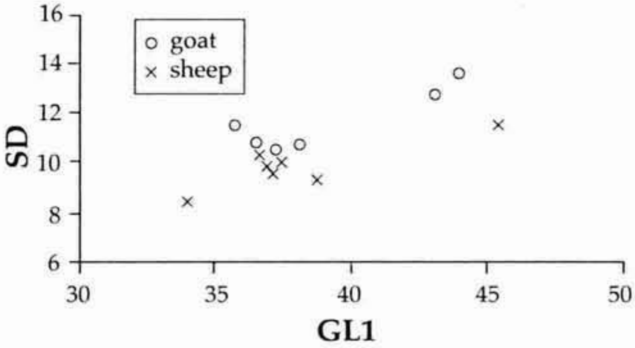

Figure 12.21. *Sheep and goat phalanges, phase IV, biometry.*

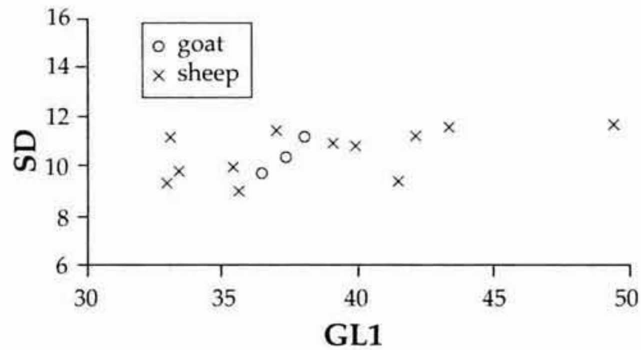

Figure 12.22. *Sheep and goat phalanges, phase V, biometry.*

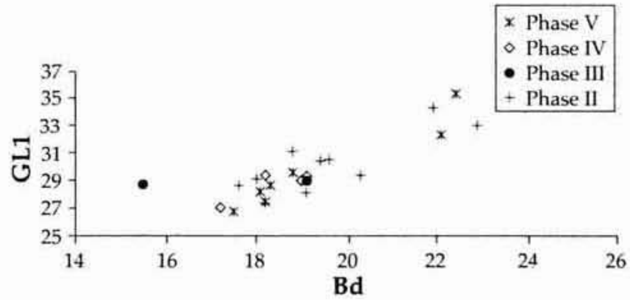

Figure 12.23. *Goat astragalus biometry.*

to occur in periods II and III respectively. Values for the astragalus and humerus in the subsequent periods IV and V appear to increase, although their actual ranges overlap considerably. If we consider bivariate analyses of selected measurements, a similar pattern can be seen (Figs. 12.16–12.19). These data clearly show that the sheep from phase II are, with the exception of some outliers, much larger than most from the other phases, and are certainly a distinct group when compared to those from other phases.

When considering the biometry of sheep and goats, it is also clear that the relationship of size and shape is particularly marked between phases II and V (Figs. 12.20–12.22), perhaps indicating that a different variety of goat, more robust and stocky, is present in phase IV. This pattern is not evident, however, when considering astragalus measurements (Fig. 12.23), although the size of goat, unlike sheep, appears to be relatively homogeneous through time.

The fish remains

Tell Brak is situated 3 km west of the Jaghjagh stream, about 3 km north of its confluence with the Wadi Radd. Some 40 km further downstream the Jaghjagh flows into the Habur river which is a tributary of the Euphrates. Critical reviews of the fish fauna from the area of the Tigris–Euphrates basin have been published by Banister (1980) and Coad (1991; 1996), showing that for certain areas additional fieldwork is required and that systematic revisions of certain problematic taxa are needed. The ichthyofauna of the Habur river is relatively well-documented thanks to the recent surveys undertaken by Krupp & Schneider (1991; in press). The Habur river harbours at least 31 species of fish, four of which are recent introductions. The ichthyofauna of the region is very diverse but the major food taxa belong to only two families, the Cyprinidae or carp family, with numerous important food species, and the Siluridae with the catfish *Silurus triostegus*. These are still today the major food fish available on local markets. In September 1997 one of us (WVN) collected modern fish from Hasake market and prepared skeletons of the major economic species for comparison.

Table 12.3. *Fish species from hand-collected assemblages.*

	Phase III	Phase V
	0	0
Acanthobrama marmid	0	0
Aspius vorax	0	0
Barbus esocinus	0	0
Barbus luteus	0	1
Barbus sp.	0	8
Cyprinidae indet.	2	75
Silurus triostegus	1	13
Mystus pelusius	0	0
Liza abu	0	0
Mastacembelus mastacembelus	0	0
Total identified	3	97
Total indet	4	7
Grand total	7	104

The fact that fish remains have received little attention thus far in archaeozoological reports from Syrian sites results mainly from the insufficient recovery techniques employed. Early historic faunal assemblages with fish bones published to date are hand-collected samples characterized by a small number of fish remains. Their proportion of the total amount of identified remains ranges between 0.05 per cent at the second-millennium BC site of Tell Sheikh Hamad (Becker 1991) and at third-millennium Tell Halawa (Boessneck & von den Driesch 1989) to 0.56 per cent at the second-millennium BC site of El Qitar (Buitenhuis 1988). The sieving campaigns carried out at Tell Brak account for the high proportion of fish bones which represent the best sample available thus far for the third and second millennia of Syria.

The material

The number of fish remains collected during the 1994–96 seasons at Tell Brak totals 1276 fragments of which 69 per cent were identifiable. Ninety per cent of the hand-collected fish bones were identifiable: in the 3.5 mm fraction this was 68 per cent and in the 1 mm fraction 67 per cent. The species lists are given separately for the bones from the 3.5 and 1 mm samples, since the volumes from which they were retrieved differ (Tables 12.3–12.5). Besides a taxonomic identification, the bones were also used for a size reconstruction of the fish. These fish lengths are expressed in cm standard length (SL) which is the distance from the snout to the base of the tail. The standard lengths were obtained through direct comparison with modern specimens of known size.

Cyprinidae: More than 60 per cent of the identified fish remains belong to the cyprinid family, a taxon that is represented by 19 species in the Habur. The large number of species, and their similar osteology, hamper identifications beyond the family level. Nevertheless, it was possible to identify a number of fragments to genus or species level. Forty-five skeletal elements could be attributed to the genus *Barbus*, comprising mainly pharyngeal plates (18 specimens) and the fused second and third vertebrae which are

Table 12.4. *Fish species from wet-sieved residues (>3.5 mm fraction).*

	Phase I	Phase II	Phase III	Phase IV	Phase V
Acanthobrama marmid	0	0	0	0	0
Aspius vorax	0	0	0	0	1
Barbus esocinus	0	0	0	0	3
Barbus luteus	0	0	0	0	0
Barbus sp.	0	0	1	1	30
Cyprinidae indet.	0	5	7	25	211
Silurus triostegus	0	2	3	0	49
Mystus pelusius	0	0	1	0	0
Liza abu	0	0	0	2	2
Mastacembelus mastacembelus	0	0	0	0	2
Total identified	0	7	12	28	298
Total indet	2	2	4	11	142
Grand total	**2**	**9**	**16**	**39**	**440**
volume sieved to >3.5 mm	240	487	1758	1261	1737
fish bones per 100 litre	0.83	1.85	0.91	3.01	25.33

Table 12.5. *Fish species from wet-sieved residues (>1 mm–<3.5 mm fraction).*

	Phase II	Phase III	Phase IV	Phase V
Acanthobrama marmid	0	0	3	0
Aspius vorax	0	0	1	0
Barbus esocinus	0	0	0	0
Barbus luteus	0	0	0	0
Barbus sp.	0	1	2	2
Cyprinidae indet.	3	7	86	90
Silurus triostegus	0	3	9	4
Mystus pelusius	0	0	2	0
Liza abu	3	2	217	0
Mastacembelus mastacembelus	0	0	2	0
Total identified	6	13	322	98
Total indet	4	27	110	79
Grand total	**10**	**40**	**432**	**177**
volume sieved to >1 mm	229	835	497	807
fish bones per 100 litre	1.75	3.23	22.13	9.79

part of the Weberian apparatus (15 specimens). Five first vertebrae, four dentaries, two operculars and a hyomandibular were also identifiable as *Barbus*. The reconstructed sizes of *Barbus* vary between 10–20 and 40–50 cm SL. In addition to the generically identified specimens, four elements of barbel could be identified to species. *Barbus esocinus* is represented by three basioccipitals of small individuals (10–20 cm SL), whereas the occurrence of *Barbus luteus* is indicated by a cleithrum of an individual measuring 20–30 cm SL.

Aspius vorax is represented by a fused second and third vertebra of an individual measuring 40–50 cm SL and by a dentary of a small individual (10–15 cm SL). Two pharyngeal plates and a basioccipital indicate the presence of small (5–15 cm SL) *Acanthobrama marmid*.

Cyprinids have been reported from all faunal assemblages in Syria that have yielded fish remains. The number of specimens identified beyond family level, however, is low. Two large specimens of *Barbus esocinus* (120–130 cm total length) have been found in a third-millennium BC context at Tell Halawa (Boessneck & von den Driesch 1989), and *Barbus grypus* has been reported from the site of Ibrahim's Garten (mid-second millennium BC) at Tell Munbaqa (Boessneck & Peters 1988). *Barbus* sp was identified at the site of Kuppe (2200–1900 bc: Early Bronze Age IV) at Tell Munbaqa (Boessneck & Peters 1988). Taxa other than *Barbus* have only been reported thus far from Syria in the much later Romano-Byzantino-Islamic site of Apamea and include *Leuciscus*, *Capoeta*, *Chondrostoma regium* and *Aspius vorax* (van Neer 1984).

Silurus triostegus: Almost 10 per cent of the identified fish bones belong to this catfish which can attain a total length of more than 2 m. The remains collected at Tell Brak are from individuals with a reconstructed standard length between 10–20 and 80–90 cm SL. It is unclear whether this small average size is related to the fishing techniques that failed to capture larger specimens or if it reflects the effects of overfishing. This species has been reported previously in Syria from a third millennium context at Tell Halawa (Boessneck & von den Driesch 1989) and from the Kuppe area (2200–1900 BC: Early Bronze Age IV) at Tell Munbaqa (Boessneck & Peters 1988).

Mystus pelusius: This catfish species belonging to the Bagridae family is of little commercial value today as a result of its small size (maximum length about 25 cm). At Tell Brak the presence of this species is indicated by a pectoral spine, a dorsal pterygiophore and a cleithrum from individuals measuring between 15–20 and 20–30 cm SL. *Mystus pelusius* has been reported previously from the Romano-Byzantino-Islamic site of Apamea, located along the Orontes (van Neer 1984).

Liza abu: This species belongs to the mullet family Mugilidae which comprises mainly marine species, some of which enter estuaries or ascend rivers seasonally. *Liza abu* occurs mainly in freshwater and, unlike the other members of the family, is also able to reproduce in rivers. The species lives in the Habur river but is also found as far inland as the upper reaches of the Tigris river in Turkey (Geldiay & Balık 1996). The maximum size of this fish is about 25 cm. Remains of this species were mainly found in the 1 mm sieve fraction (222 specimens). It is rare in the 3.5 mm residue (four specimens) and totally absent in the hand-collected material. Almost 75 per cent of the remains are vertebrae (168 specimens) and 16 per cent (or 37 specimens) are dorsal and anal fin spines. The other skeletal elements present are five dorsal and two anal pterygiophores, three ventral fin spines, three basipterygia, three basioccipitals, an articular, a premaxilla, a hyomandibular, a preopercular, and an opercular. The 185 bones that allowed a size reconstruction indicate that the majority of the fish (73 per cent) measured between 10 and 20 cm SL, whereas the remaining 27 per cent were smaller than 10 cm SL.

More than 25 per cent of the identified fish bones are from *Liza abu* but it should be underlined that this high ratio results from their abundance in one context only. Ninety-three per cent of the remains come from a 70-litre sediment sample sieved on a 3.5 mm screen and ten litres of the same sediment sieved at 1 mm. The sample was taken from pit-fill (A1143) in a surface level of trench HS3. This mullet occurs in low numbers in all the other investigated contexts.

Mastacembelus mastacembelus: The spiny eel is represented by three precaudal and one caudal vertebrae of individuals measuring between 20–30 and 40–50 cm SL. Because of their snake-like appearance, food taboos against mastacembelids occur in several areas of their vast distribution in Asia and Africa. This fish was not consumed a few decades ago in Syria (Beckmann 1962) but it now occurs regularly at the fish market of Hasake.

Frequency of fish

The fish identifications listed in Tables 12.3–12.5 have been used to calculate the relative importance of the different taxa through time (Fig. 12.24). Calculations have been made in order to correct for the different volumes sieved and, in addition, the extremely rich sample from the fill in HS3 has been kept separate. No identifiable fish remains were present from the Early Uruk period (phase I). Only 13 identified specimens were available from the Middle Uruk period (phase II) and from the Ninevite 5 period (phase III) 25 such bones were present. The later third-millennium material (phase IV) comprised 67 identifiable specimens if the bones from context A1143 are not taken into account. The richest samples belong to the second millennium (phase V) and comprise 396 identifiable bones. As a result of the relatively small numbers of bones for the earlier contexts it is not excluded that chance fluctuations have influenced the proportions of the different taxa. The trend that appears from Figure 12.24 (namely an increase through time in the importance of cyprinids and a decrease in the contribution of the catfish and mullet) must, therefore, be interpreted with caution. Could it be that the observed changes are related to a phenomenon of over-fishing which may have affected the silurid to a larger extent than the other taxa?

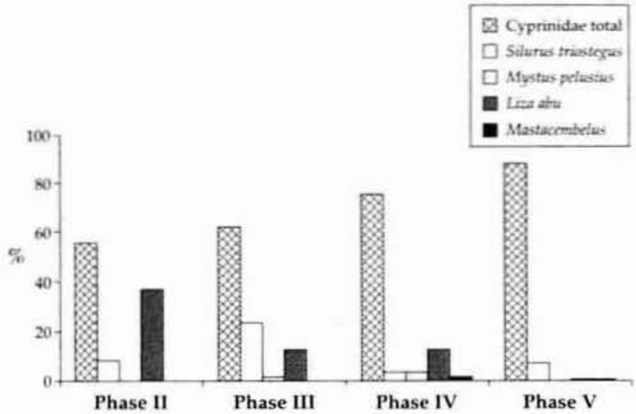

Figure 12.24. *Fish taxa through time.*

Fish biometry

A possible indicator of overfishing could be a size decrease over time. In order to use the distribution of the reconstructed lengths of the fish found at Tell Brak it is again necessary to correct for the different volumes that were sieved in each context. The results of this exercise are given in Figures 12.25–12.26.

It should be underlined that the number of fragments on which the size reconstructions of *Silurus triostegus* are based is low. A total of 60 elements was sufficiently well-preserved to allow a reconstruction of the standard length, but the bones are unevenly spread over the different phases (Fig. 12.25). The size distribution given for phase V is based on 44 specimens and can be considered a good indicator of the fish captured, although the effect of differential preservation on the various size classes cannot be quantified. For phases IV and III the number of observations are limited to eight and six specimens respectively, whereas for phase II only two bones allowed a size reconstruction.

The high proportion of large specimens during phase II is for this reason probably not significant. It is striking that in phases III and IV the majority

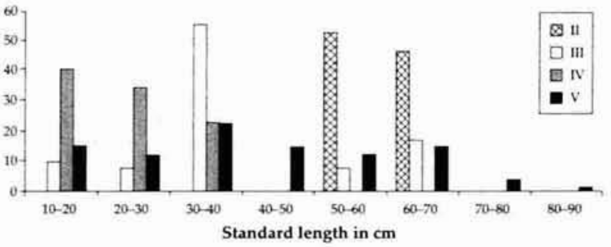

Figure 12.25. Silurus triostegus *biometry through time.*

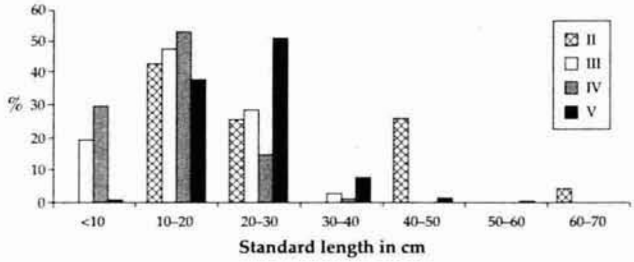

Figure 12.26. *Cyprinidae biometry through time.*

of the catfish have a reconstructed standard length below 40 cm. In phase V the sizes vary between 10 and 90 cm SL with a more or less even distribution between the size classes 10–20 and 60–70 cm. Specimens larger than 70 cm are rare. The data available thus far do not allow us to document a possible shift in the average sizes of *Silurus triostegus*. It is clear, however, that the specimens were always of rather small average size, never coming close to the reported maximum size of 2 m.

The size distributions of the Cyprinidae have also been considered through time (Fig. 12.26). More bones are available that allow a size reconstruction than in *Silurus triostegus*. Ninety and 286 such elements are present for phases IV and V respectively but for the earlier phases the material is rare. Seven cyprinid bones from phase II and ten from phase III could be used for size reconstruction. From the graph it appears clearly that the majority of the captured cyprinids were between 10 and 30 cm SL in all the considered phases. No clear shift occurs through time, and the few large specimens from phase II may have distorted the picture as a result of small sample size, whereas the high amount of cyprinids smaller than 10 cm SL in phase IV is due to their abundance in the 1mm fraction of the HS3 pit-fill (A1143).

Discussion

The animal bone assemblage from Tell Brak is not large in terms of numbers of identifiable fragments and, considering its broad temporal and spatial diversity, any conclusions and interpretations that are drawn have to be regarded with considerable caution. Nevertheless, some interesting patterns in the data may help to shed some light on broader archaeological questions.

The domestic economy

The data from Tell Brak are perhaps best considered in the context of information recovered from other sites in the region. In terms of vertebrate remains from the northern steppe region of the Habur, numerous contemporary and earlier assemblages have been reported upon and stimulatingly synthesized by Zeder (1991; 1995; 1998b; 1999). Thus, archaeological information indicates that by the third millennium BC the northern steppe was increasingly densely settled, leading to the establishment and rapid growth of large urban centres. Here emerged an urban-based economic system organized by the state (Zeder 1999). Animal bone assemblages from a range of sites in this region indicate that from the fourth millennium BC there was an emphasis on domestic livestock, and more specifically a heavy reliance on caprine husbandry. This focus on caprine herding in the Habur basin may be linked to the production of wool and hair for the expanding urban textile industry, which has been posited as a reason for the expansion of settlement onto the virgin pasturelands of the southern steppe during the third millennium BC (Zeder 1998b). Here, specialist pastoralists are thought to have stimulated a gradual transformation from an indigenous localized broad-based economy into a uniform, controlled and highly specialized one. Since wool was the most easily stored sheep product it was the most suitable resource for controlled distribution. Thus control over this production and distribution appears to have been extremely important (Zeder 1991).

The limited data from the Tell Brak assemblage concerning the relative importance of caprine to other animals do not wholly support this general hypothesis. Although sheep and goat remains are certainly the most common domestic animal throughout the sequence, it is clear that their importance, rather than increasing, steadily declines between the fourth and second millennia BC (from >90 to <45 per cent). Age at death data, however, suggest that the animals from the late third millennium BC were kept for their secondary products, probably wool. In fact it has been postulated that a focus on a single or limited range of age groups is likely to be most obvious where specialized administrative and economic activities were performed (Zeder 1991).

The remains of pig also tell an interesting story. In Zeder's survey, pigs were found to have been important at a number of sites in the Habur basin, although their frequency rarely exceeded 20 per cent of any assemblage. Through the third millennium the relative importance of pig husbandry declined at most sites in favour of caprine herding. This trend is not observed, however, at Tell Brak. Instead, pigs appear significantly to increase in importance during the late third millennium BC where they reach between 40–50 per cent of the total assemblage. Changes in the exploitation of pigs and caprines can be explained in a number of ways, and which focus upon environmental, socio-economic and political factors.

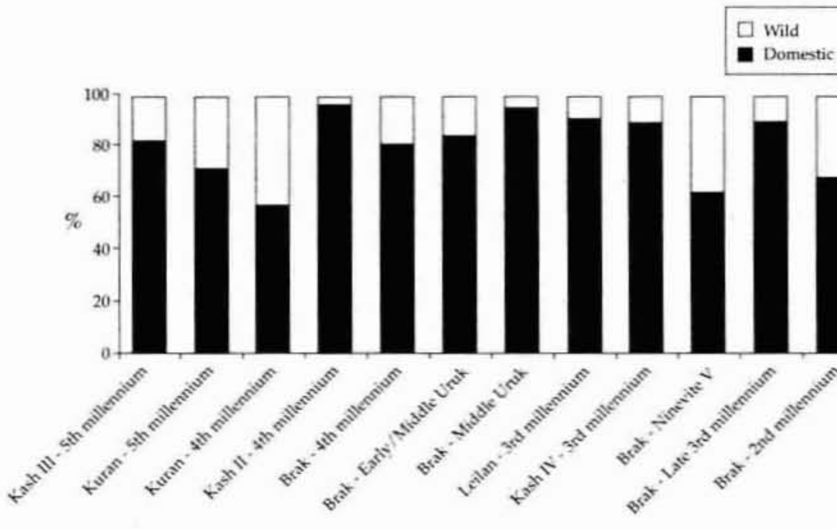

Figure 12.27. *Wild and domestic in mammal assemblages from the Habur basin, northern steppe (partly after Zeder 1998b), and Tell Brak.*

In terms of purely dietary considerations, there is no doubt that pigs provide the highest calorific return. Their intensive large-scale keeping can be severely constrained, however, by both ecological and maintenance factors. Their high water requirements, poorly suited to semi-arid regions where shade is limited, and an inability to utilize cellulose-rich pasture plants, rendering them often less rewarding than large flocks of sheep, mean that pigs are best kept close to or within the settlement. In densely settled areas they are best kept in sties, suggesting that swine-herding may rarely have been a large-scale regulated activity at sites in the Near East (Zeder 1998a), although there is considerable evidence for state-level exploitation of pigs in third-millennium south Mesopotamia (Matthews 1985). Small-scale sty-based pig-keeping therefore most likely took place in smaller household units.

Several other sites provide further support for a possible socio-economic differentiation in swine-keeping. At Al Hiba in south Mesopotamia, Mudar (1982) suggests that pigs were more important in lower-status residential households than in an élite temple district. Closer to Brak, at Tell Leilan higher quantities of pigs, up to 60 per cent (a similarly high frequency to that from late third-millennium deposits from Tell Brak) were found in a so-called workers residential area. These representations have been interpreted as differences in diet between élite elements of society and workers (Weiss *et al.* 1993).

The small-scale keeping of pigs could thus be considered as a supplementary resource, perhaps produced and used by lower-status residents of the town. Local production of pork may have conferred an element of autonomy to individual groups or households, making pig-raising undesirable in the eyes of urban authorities wishing to retain broad control over production and supply (Zeder 1998a). This factor may help to explain the eventual taboo on pork consumption in the region (Diener & Robkin 1978). Pigs may have been an important and reliable resource in times when weaker political integration and control was the norm, becoming less important when centralised control was established (Zeder 1991). The apparent focus upon the consumption of very young pigs may, however, indicate their importance to the higher status/élite elements of society at Tell Brak which were supplied by those of lower social rank.

Hunting wild mammals

At the sites of the northern steppe surveyed by Zeder (1998b), wild resources appear to have played little part in the urban economics of the fourth millennium. Through the third millennium in the middle Habur there appears to have been a further decline in the importance of wild game, specifically gazelle and onager, until by the mid–late third-millennium exploitation of these species was negligible (Fig. 12.27). Data from Tell Brak, however, indicate that during the Ninevite 5 period remains of gazelle reached nearly 40 per cent of the total assemblage. Interestingly, at Tell Kuran numerous bones of gazelle, *c.* 200+ animals represented mostly by foot bones, were recovered from a late fourth-millennium deposit, in this case in a matrix approximately 5 cm thick and no more than 1 m^2. Their presence in such high frequencies at both sites suggests that wild game was more abundant in densely settled rain-fed farming areas of the northern steppe (Zeder 1999) and also indicates that one particular species of wild game was extremely important to the inhabitants during this period.

Similar to (or in contrast with) arguments proposed for the high frequencies of pig remains, it could be argued that the presence of wild game may reflect the existence of a higher-status element of society. It has also been suggested that the degree to which wild resources were utilized could constitute a direct measure of the effectiveness of the provisioning system in meeting distribution requirements. In other words, the less effective a system the more pressure to supplement basic resources with game, especially ubiquitous species that are easily collected and caught (Zeder 1991). Whatever the reason, at Tell Brak it is clear that the Ninevite 5 period is one of major transition, aspects of which are represented in the vertebrate remains from the site.

Fish exploitation

From the data concerning the size classes of the fish taxa recovered, it is clear that fishing techniques enabled the regular capture of small specimens. It is likely that nets with relatively small mesh size were used. Such gear would have allowed the capture of the majority of the recorded taxa, although different types of nets may have been employed. The mullets live closer to the surface than the cyprinids whereas the spiny eels are typical bottom dwellers. Other fishing gear such as baskets and hook and line may have been used as well, but there is little in the way of archaeological evidence for these elements.

In principle, fishing may have been practised all year round but the best period must have been the spawning season in late spring. In that period fish tend to concentrate in shallow, bank-side areas and they are then very vulnerable to predation. Growth rings on the vertebrae cannot be used to verify this hypothesis since no modern reference material is available from specimens captured at different seasons of the year. In addition, there are some methodological problems inherent in the use of growth increments for seasonality determination (Carlson 1988; van Neer 1993).

Conclusions

Although not great in number, the vertebrate remains from the 1994–96 seasons of excavations at Tell Brak have provided further important insights into the dynamics of economic, social and cultural change in the northern steppe region of Mesopotamia through the fifth to second millennia BC. This study has partly corroborated conclusions drawn from other wider syntheses within the region, and also highlighted important differences between the vertebrate assemblages from Tell Brak and other contemporary sites. As already stressed, the sheer size and scale of the settlement at Tell Brak means that any conclusions drawn from such small-scale samples must be tentative indeed. Nevertheless, these data and interpretations provide a provisional basis on which future work can build.

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